"I fill three quarters of immensity!" Satires of Early Nitrous Oxide Research

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In early 1799 the twenty-year-old scientist Humphry Davy published a brief letter announcing his discovery that nitrous oxide gas could safely be respired by humans; a full account of this research appeared in the summer of 1800.[1,2] During this period Davy worked in Clifton, just outside the English seaport of Bristol, under the tutelage of Thomas Beddoes, a physician who for many years had researched the possible therapeutic uses of gas inhalation. In addition to patients who appeared at Beddoes' clinic and research facility, the Pneumatic Institution, Davy and his mentor were joined in their research by more than forty healthy individuals, including Samuel Taylor Coleridge, Robert Southey, Peter Mark Roget, Thomas Poole, James Mackintosh, Anna Laetitia Barbauld and James Watt.[3] This work by Beddoes and Davy was quickly replicated elsewhere in England and within a few years in the United States.[4]

For the past several years I have been investigating aspects of nitrous oxide research between 1799 and 1844:

- Beddoes/Davy research in England
- Woodhouse/Barton replications in America
- Dispan replication in Toulouse, France (ca. 1806)
- Nitrous oxide in chemistry/medical textbooks
- Public and classroom demonstrations of nitrous oxide inhalation
- Satiric attacks on this research

Although Davy suggested nitrous oxide inhalation as a possible surgical anesthetic, he never attempted such a use. Neither did anyone else until Horace Wells successfully anesthetized several of his dental patients using the gas in December 1844. I am thus investigating popular and professional knowledge of nitrous oxide in the four and a half decades between Davy and Wells in an attempt to understand why knowledge of the gas was so widespread and yet anesthesia was not attempted. A similar situation existed with ether—an agent known for many years and in its gaseous state used for recreational purposes in the early nineteenth century. Yet no one attempted to produce an anesthetic state with ether gas until Crawford Long and William Morton did so successfully in the early and mid-1840s.[5]

Chemist Joseph Priestley first isolated nitrous oxide in 1774 or 1775 in the midst of his extensive research on a series of gases.[6] He noted a few basic characteristics about nitrous oxide, but did not attempt to respire it himself. By the mid-1790s, American physician/scientist Samuel Latham Mitchell was proclaiming nitrous oxide to be the source of all contagious diseases.[7,8] At the same time Beddoes' career was on a collision course with nitrous oxide.

Thomas Beddoes' life and work have been admirably explored by Stansfield and Porter.[9,10] Beddoes trained as a physician in Edinburgh; and by the late 1780s he was teaching chemistry at Oxford. Beddoes was apparently popular as a lecturer, but his penchant for supporting radical political movements forced him to leave Oxford in the early 1790s. While at Oxford Beddoes developed an interest in possible medicinal applications of the gases, or "factitious airs," that were the subject of extensive experimentation and writing by Priestley, Lavoisier and many others.

Beddoes rightly decided he could build a lucrative medical practice in Bristol, then a center of British intellectual life as well as trade. Wealthy Irish landowner Richard Lovell Edgeworth, a frequent visitor to Bristol, provided Beddoes with introductions into the city's society and a wife in daughter Anna.

Beddoes' activities in Bristol during the 1790s fall into three main areas: his clinical practice as a physician, political activity and research on gases. Industrialist James Watt helped Beddoes with his gas research by designing both stationary and portable equipment patients could use to inhale the gases.[11-12] And Beddoes worked tirelessly to raise money for a Medical Pneumatic Institution, where a clinic for administering gases could be combined with teaching and research—the three elements, of course, of a modern academic medical center.[13] By 1796, Beddoes' scheme had attracted almost 200 subscribers from all over the British Isles, including 44 physicians, 19 surgeons and 14 clergymen.[14] In the fall of 1798 Humphry Davy was hired as Research Director and the Institution opened. Within two and a half years the research effort had sputtered to a halt, unsuccessful in effecting disease cures with gas inhalation. Davy left Bristol in March 1801 for the fledgling Royal Institution, where his career as a chemist flourished over the next decade.[15]

In London Davy continued to give demonstrations of nitrous oxide's effects for a year or so. Over the next decade several successful attempts were made in England, America and continental Europe to replicate Davy and Beddoes' work with nitrous oxide. One of the most elaborate attempts was made in 1807 by William P.C. Barton, a University of Pennsylvania medical student. By 1810 knowledge of nitrous oxide and its effects was available in public and classroom demonstrations, and chemistry and medical textbooks, a situation that continued for over three decades.[4] Satires of nitrous oxide effects and research quickly became another way in which this knowledge was transmitted.

Beddoes had been the subject of a comic attack long before his research on nitrous oxide. Erasmus Darwin, poet, successful physician and member of the Lunar Society, read Beddoes' writings on gases and disease and recommended Beddoes to James Watt when his own treatment of Watt's tubercular child proved unsuccessful. In 1793 Beddoes published *A Letter to Dr. Darwin* in which he outlined his new treatment for consumption patients.[16] An anonymous wag, perhaps someone who knew Beddoes from his Oxford days, responded the following year with *The Golden Age, a Poetical Epistle from Erasmus D__ N. M.D., to Thomas Beddoes, M.D.*[17] This parody, written in the style of Darwin's own poetry, attacked some of Beddoes' more outlandish scientific ideas—such as the notion that animal products like butter and tallow could be produced from vegetables. In the opening lines the poem announces:

Eternal war with Dulness born to wage,
Thou Paracelsus of this wondrous age;
Beddoes, the philosophic Chymist's Guide;
The Bigot's Scourge, of Democrats the Pride;

Although meant to denounce Beddoes, whose political pamphleteering had made him notorious, these lines accurately describe the thinker who attacked the politi-

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cal and medical status quo of this "wondrous age." *The Golden Age* also managed to skewer Darwin and his popular poem *Botanic Garden,* with its obvious sympathy for the French Revolution.[18]

Later in the decade Beddoes and Darwin were also pilloried by writers George Canning and Benjamin Frere in the Tory publication to which they contributed, the *Anti-Jacobin Review.* In a mock account of a voyage to the Far East, the two physicians are mentioned in a list of passengers, including other political and social radicals like William Godwin. On board is a stench and

... Beddoes and Darwin engage to repair
This slight inconvenience with oxygen air,

A mock Latin poem by Frere notes in the introduction, "The subject is Dr. Beddoes' *Factitious Air applied to the case of Consumption.*"[19]

In December 1799, Beddoes published a pamphlet describing the first few months' research on nitrous oxide inhalation in humans, which had begun in March.[20] This item contains accounts by some of the earliest participants describing their own reactions to nitrous oxide inhalation. Davy's massive 580-page report on the basic, animal and human research appeared the following summer.[2] In the same year the first two satiric accounts of the Pneumatic Institution work also were published. The mechanism of this speedy response by anti-Jacobin writers is unclear, unless we assume that supporters of the Crown kept track of Beddoes' every movement. Indeed, some of his political activities in Bristol were reported to London.[21] However, Beddoes' tireless promotion of his gas research and the involvement of so many intellectuals in the nitrous oxide research, as well as what many observers saw as the comic effects of nitrous inhalation upon humans, may have kept Beddoes' Institution more in the public eye than the published record would indicate.

One of the first poetic satires was "The Pneumatic Revellers: An Ecologue," which appeared in the *Anti-Jacobin Review and Magazine* in 1800.[22] Although published anonymously, the poem is known to have been written by the prolific Richard Polwhele, a frequent contributor to that journal. Polwhele was "a country clergyman and well-known Cornish poet and historian", remembered today for "his blatantly anti-feminist poem, *The Unsex'd Females...*[23]

Polwhele's poem seems to be based on Beddoes' pamphlet. Five characters describe their reactions as they "drink" nitrous oxide; although identified only by initials, their identity is obvious and the accounts of all but one were included in Beddoes' 1799 publication. Besides Beddoes himself, there is Reverend Rochemont Barbauld, the Unitarian minister, and his wife Anna Laetitia, the poet and "children's friend." Also appearing are poets Robert Southey and George Dyer. Dyer's presence is interesting. Although an associate of Coleridge's, Dyer is not known to have either participated in or observed activities at the Pneumatic Institution. He does not appear in either Beddoes' pamphlet or Davy's account, nor in such reminiscences of the events as those by observers Joseph Cottle and Maria Edgeworth.[24-25] Davy does tantalize us with the observation, "Many other persons have respired the gas, but as their accounts contain nothing unnoticed in the details, it is useless to particularize them."[26] Did Polwhele know something about attendance at the gas respirations that we don't?

The poem consists of a prose introduction, an opening monologue by Beddoes, and statements by the five characters while under the influence of nitrous oxide. The introduction links Beddoes with Darwin and Godwin. Beddoes is "combining in his own great and comprehensive mind, the theories of Darwin and Godwin; and applying his dephlogisticated nitrous gas to the purposes of both these philosophers. . ." Not only is Beddoes tainted by this association with radicals; he is also depicted as undermining serious intellects. In his monologue, Beddoes says he tried the gas "on a learned society.";

.... each was as light as a feather:
And they, every one, cried it was a pleasure extatic
To drink deep draughts of the mighty pneumatic.
As if by a wizard entranced,
How wildly they shouted, and gambol'd and danc'd

Such behavior was apparently associated by contemporaries with the research taking place at the Pneumatic Institution, and is entirely probable, given the light levels of gas patients and volunteers were inhaling.

Statements in the poem by the other participants reinforce this portrait of silliness and loss of control being developed by the author. Dyer notes, "I have drawn the nitrous gas / O! I know not where I am! / Sure, I am not what I was." Reverend Barbauld proclaims, "My frisky spirits are all spent at once, / And in the sad residuum leave—a dance!" His wife Anna declares that breathing nitrous oxide is "sweeter far that inhalation, / Sweeter than the breath of fame." Robert Southey is depicted as ascending to the stars:

. . . I spurn, I spurn
This cumbrous clod of earth. . .
. . . and from star
to star still gliding. . .
Ingulph the dephlogisticated floods
of life and riot in immortal Gas!

Beddoes himself is depicted as an egomaniac: "And in me, with loud plaudits, the people shall own/ A discovery to shame the Philosopher's Stone. . ."

Thus Polwhele has depicted a group of radical thinkers making themselves ridiculous by nitrous oxide inhalation. This supposed scientific advance, promoted by Beddoes for years, is also explicitly associated with political radicalism near the end of the poem. After all the participants inhale and dance again, they sing:

Then hail, happy days! when the high and the low,
All nourish'd alike, from this air-hospitality
Shall together with Gas-born benevolence glow,
And prove, that true bliss must arise from equality.

In order to depict these events, Polwhele must have had inside information about events at the Pneumatic Institution. Beddoes' pamphlet naturally portrays the research in a serious tone. Interestingly, Davy, Coleridge and others are discussed in Beddoes' work, but not in the poem. Perhaps Polwhele chose the best known participants for his characters, although that could still not explain Dyer's presence.

Another relevant work also appeared in 1800, the anonymous *The Sceptic.*[27] This item is a meditation on "The Birth of Wonders!" in which the author declares, "I have no doubt of being able to convince you that this is a day of great things! — an Era big with wonders; — Some of which are already brought to light!. . . The most redoubtable of this birth was baptis'd Revolution. . ." Further attacks are made on the work of Franz Mesmer, Antoine Lavoisier, and the "Quacks-Pneumatic." Those "bladder conjurers" are branded pimps whose female patients, "if certain innuendo's have foundation", have become pregnant. One of these characters is a Dr. Thistleton, whose lengthy medical publications are plagiarized extracts from other authors—a clear attack on Beddoes, whose numerous medical publications in the 1790s contained extensive extracts of letters from fellow physicians describing their cases of gas inhalation treatment. Dr. Thistleton was a member of the group that "brew quantities of air, or gases as they call them. . . which

they retail by the bladder-full; and like the quacks of the old school. . . they publish wonderful accounts of wonderful cures, effected by breathing so many bladders full of air a day." The anonymous author does concede that gas inhalation may have some benefit, but "With respect to their speculations and their theories; so long as they are devoid of principles, and abundant in inconsistencies and absurdities, I must beg leave to remain as usual, a sceptic." The only real individuals from the nitrous oxide story who appear in this account are Davy and Count Rumford. Rumford, who had founded the Royal Institution in 1799, invited Davy to join him in London, which Davy did in March 1801. Rumford was apparently impressed with Davy's published account of the Bristol experiments.

One of the most biting attacks on the nitrous oxide experiments of this period is James Gillray's famous caricature. This 1802 engraving depicts a nitrous oxide demonstration at the Royal Institution and is entitled, "Scientific Researches! New Discoveries in Pneumaticks! or, an Experimental Lecture on the Powers of Air." A satanic-looking Davy holds a bellows and presides over the scene. Dr. Garnet administers the gas to Sir J.C. Hippesley, who is suffering a monstrous case of flatulence as a result. Visible in the room are Count Rumford, D'Israeli, Earl Gower, Lord Stanhope, Earl Pomfret and Sir Henry Englefield.[28] This depiction must have been especially painful to Davy, who was just beginning his rise to incredible fame and scientific success at the Institution; and may have been the reason why Davy ceased nitrous oxide demonstrations within a year or so after moving to London in March 1801.

In the first decade of the nineteenth century, American poet and author Thomas Green Fessenden (1771-1837) spent several years in London. During his stay he published a long poem satirizing many of the medical and scientific advances of the day. First published as *A Poetical Petition Against Tractorixing Trumpery*, Fessenden's poem has a tortured publication history through numerous editions and under various titles, but was still being issued in 1837, the year he died. It is this work attacking the nitrous oxide experiments that Philadelphian William Barton, who attempted in 1806 to replicate Davy's experiments, mentions in his medical school dissertation.[28]

Fessenden's poem contains a long prose introduction that is primarily an attack on Perkinism, a medical fad of the day involving metallic tractors—thus Fessenden's original title. The first of four cantos in the poem is a sustained attack on Beddoes' work, featuring lengthy footnotes that often occupy most of the page. The narrator of the poem declares, "I've found a substitute for wit. . . Beddoes (bless the good doctor) has / sent me a bag full of his gas, / which, snuff'd the nose up, makes with brighter, / And eke a dance an airy writer."

This precious gas, sirs, is the pink
Of pure philosophy,—the link
With which great metaphysicians bind
To worlds of matter, worlds of mind.

The narrator declares he will "follow Southey's bold example" and breathe the gas. The effects in this satiric context are predictable:

Inflated with supreme intensity,
I fill three quarters of immensity!
Should Phebus come this way, no doubt,
But I could blow his candle out!

This earth's a little dirty planet,
And I'll no longer help to man it. . .[30]

In his footnotes Fessenden refers to Priestley and Darwin several times and quotes extensively from Davy's book.

These three publications and Gillray's caricature constitute a sustained contemporary attack on efforts at political, medical and scientific progress. In his brilliant account of British chemistry during this period, Golinski describes the situation. "In a climate that was increasingly unfavorable to Beddoes' enlightened aspirations, the experiences of the Bristol group appeared to many as the shared delusions of an isolated religious sect. . . in the three decades thereafter, nitrous oxide became the material of public entertainment, rather than of serious medical research."[31] Public knowledge of nitrous oxide did not have an auspicious beginning.

In 1814, Philadelphian Moses Thomas published a pamphlet in which he used events at a public nitrous oxide demonstration to poke fun at political events in the United States. Thomas' work contains lengthy descriptions of the preparation and chemistry of nitrous oxide, as well as a long account that may be the first published reference to such a demonstration in the United States. The ending of Thomas' pamphlet makes explicit his concerns. "It appeared to me as though the United States of America, in congress assembled, had inhaled an imprudent portion of the exhilarating gas. . . It grieves me to expose the nakedness of my country—in a state of political intoxication. . ."[32] Linking political conditions to the state of mind produced by nitrous oxide inhalation was a useful tactic in America, too.

One of the strangest appearances of nitrous oxide in a satiric work was published in 1820. *Doctor Syntax in Paris* was one of many imitations using the peripatetic schoolmaster created in 1809 by William Combe and others.[33] The work includes an illustration and a long poem depicting the usual antics induced by nitrous oxide inhalation. However, this account also describes the relief of a toothache by the gas inhalation, a phenomenon also noted by Davy. This poem has been reprinted and extensively analyzed by Smith.[34]

Beginning in the 1830s, other types of satire appeared. "Laughing Gas" is a comic song written by W.H. Freeman.[35] The song lyrics describe "Poor Jeremy Jones," a man racked with grief, who "swallowed a bladder of laughing gas. . . [and] convulsed with Laughter, he homeward goes!" A comic engraving by George Cruikshank depicting a public demonstration of gas inhalation appeared as the frontispiece of an 1839 monograph; why this image is the only illustration in John Scoffern's serious chemistry text remains a mystery.[36] In the 1860s another song appeared, "Laughing Gas, or, A Night at the Polytechnic." Written by John Nash, the song tells the story of "Young Humphrey Brown" who falls asleep in the lecture hall, awakes to find himself alone and sees a glass beaker marked "Improved Laughing Gas."[37] Depiction of nitrous oxide inhalation for comedic effect has continued in modern times in the form of L. Todd's "underground' comic, "Dr. Atomic Tells How to Make and Use Nitrous Oxide."[38]

Satiric portrayals of physicians and medical practice have been a staple of popular culture for centuries. The long eighteenth century is particularly rich in such materials, ranging from Swift in *Gulliver's Travels* to Voltaire in *Candide*, Glyster in *A Dose for Doctors* and the caricatures of Hogarth and Rowlandson.[39-42] In this context the satiric portrayals involving nitrous oxide are embedded.

By the spring of 1800 the gas trials in Bristol had ceased. The research seemed to be leading nowhere; consumptive and other patients were not getting better and the experiments attracted increasing ridicule from Beddoes' political opponents. In the summer Davy's book appeared, but after a few more months at the Institution he fled to London and over two decades of increasing fame and fortune. Beddoes kept the facility open a few more years as a clinic and even published two more articles on nitrous oxide.[43-44] His political radicalism ceased, and he spent the few remaining years of his life primarily in public health areas. A few attempts were made in London to replicate the nitrous oxide work, and

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James Woodhouse and William Barton pursued the matter in America later in the decade.[4]

Knowledge of nitrous oxide slipped into a sort of suspended animation. The Bristol group had established that inhalation of the gas by humans was safe and had designed and tested elaborate equipment for that purpose. Davy speculated on the relief of surgical pain by gas inhalation. The next leap never occurred; however, a wall of ridicule stood in the way.

Yet the information about the manufacture and psychological effects of nitrous oxide survived in subsequent decades in a variety of ways. Chemistry professors gave classroom demonstrations; and itinerant showmen toured America and England providing entertainment and information to local audiences. Medical and chemistry textbooks usually included some information about nitrous oxide, and often mentioned Davy's work.[4] These forms of popular and professional knowledge thus provided a bridge over the satires, and brought nitrous oxide to Hartford, Connecticut, on that fateful night in December 1844, when young dentist Horace Wells attended just such a public demonstration and had a brilliant idea—the same one Davy had expressed four-and-a-half decades earlier.

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